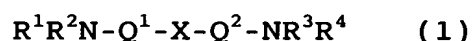
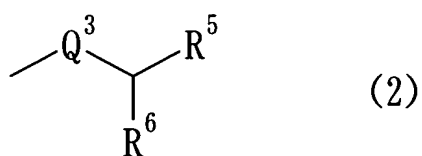


Claims

1. A ligand represented by the formula (1):



5 wherein R^1 , R^2 , R^3 and R^4 are each the same or different and represent a group represented by the formula (2):



wherein Q^3 is an optionally substituted alkylene group, an optionally substituted cycloalkylene group, an optionally substituted arylene group or an optionally substituted divalent heterocyclic group; R^5 is an optionally substituted alkyl group, an optionally substituted aryl group or an optionally substituted heterocyclic group; and R^6 is a substituent which may coordinate or bind to a metal atom, or R^5 and R^6 , taken together, may form a ring,

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Q^1 and Q^2 are each the same or different and represent an optionally substituted alkylene group or a single bond, and

X is a divalent spacer.

20

2. The ligand according to claim 1, characterized in that the ligand is an optically active compound.

3. The ligand according to claim 1, characterized in that no asymmetric carbon atom is present in the formula (2).

25

4. The ligand according to any one of claims 1 to 3, characterized in that the spacer is an optionally substituted alkylene group, an optionally substituted
5 arylene group or an optionally substituted divalent heterocyclic group.

5. The ligand according to any one of claims 1 to 4, characterized in that the length of Q^1-X-Q^2 is from 2 to 30
10 angstroms.

6. The ligand according to any one of claims 1 to 5, characterized in that Q^3 is an alkylene group of 1 to 6 carbon atoms.
15

7. The ligand according to any one of claims 1 to 6, characterized in that R^5 is an aryl group.

8. The ligand according to any one of claims 1 to 7,
20 characterized in that R^6 is a hydroxy group, an alkoxy group of 1 to 6 carbon atoms, an amino group or a substituted amino group.

9. The ligand according to any one of claims 1 to 6,
25 characterized in that the ring formed when R^5 and R^6 are taken together is an oxazoline, a pyrrolidine or a piperidine.

10. A complex compound characterized by containing, as a

constituent element, the ligand according to any one of claims 1 to 9 and a metal atom.

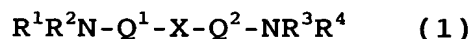
11. The complex compound according to claim 10,
5 characterized in that the metal atom belongs to any one of groups 3 to 14 of the periodic table.

12. The complex compound according to claim 10 or 11,
10 characterized in that the metal atom is lanthanum, samarium, titanium, zirconium, vanadium, rhenium, iron, ruthenium, cobalt, rhodium, iridium, nickel, palladium, copper, zinc, aluminum, tin, gold, silver or platinum.

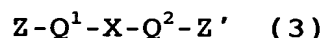
13. Use of the ligand described in any one of claims 1 to 9
15 for the production of the complex compound described in any one of claims 10 to 12.

14. Use of the complex compound described in any one of
20 claims 10 to 12 as a catalyst for asymmetric synthesis reactions.

15. A method for producing a compound of the formula (1):

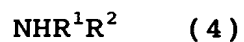


(wherein the symbols have the same meanings as defined in
25 claim 1), which comprises reacting a compound of the formula (3):



(wherein Q^1 , X and Q^2 have the same meanings as defined in claim 1, and Z and Z' are each the same or different and

represent a leaving group), with a compound of the formula
(4):



(wherein R^1 and R^2 have the same meanings as defined in
5 claim 1).

16. A method for producing the complex compound described
in any one of claims 10 to 12, characterized in that the
ligand described in any one of claims 1 to 9 is contacted
10 with a metal compound.